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Tactile Warmth Reduces Loneliness, but Visual Warmth Does Not

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ABSTRACT - Recent research in the field of embodied cognition has found that temperature can prime subjects' emotions concerning social inclusion, so that physical warmth and coldness trigger feelings of social warmth and rejection, respectively. The aim of this study ($N = 90$) was to determine whether brief tactile and visual stimuli, involving hot or cold temperatures, would affect subjects' self-reported levels of loneliness after they viewed a subsequent video clip depicting ostracism. A 2×3 between-subjects design (warm/cold prime $\times$ tactile/visual/ combined modalities) was used. The cold tactile, and cold combined (visual plus tactile), conditions were found to increase the subjects' reported loneliness, compared to warm tactile and warm combined conditions; the effect size was medium. Visual warmth versus cold had no significant effect on loneliness, however. These data replicate the finding by Bargh and Shalev (2012) that a warm stimulus can reduce loneliness, in accordance with the general theory of embodied cognition, but suggest that the stimulus must be tactile rather than visual.

Keywords:
Embodied cognition;
Physical warmth;
Loneliness; Social
inclusion; Tactile
stimulation;
Temperature
Priming; Affective
embodiment; Social
rejection

Introduction

Metaphors are often used in everyday life to express human thoughts and feelings. Those terms that involve temperature (e.g., a cold-hearted person or chilly stare) consistently associate coldness with negative judgments, whereas warmth usually refers to positive feelings (e.g., a warm

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relationship or hot date). Asch (1946) first suggested that there is a direct relationship between the ideas of physical and psychological warmth, by showing that when subjects were given lists of the same seven traits to describe a person, except with 'warm' in one condition replaced by 'cold' in the other, those who read the 'warm' label associated the target individual with more positive characteristics than those who read the 'cold' label.

Later studies have revealed that warm objects also can prime for interpersonal warmth. When Williams and Bargh (2008) used Asch's list to describe a target individual but omitted the warm/cold trait and instead physically exposed subjects to tactile warmth or cold, the results resembled those of Asch. Holding a warm cup briefly caused subjects to choose the more positive traits from the same list of bipolar pairs as best describing the individual they had read basic information about, and vice-versa for a cold cup condition. Corporeal physical warmth apparently can elicit notions of interpersonal warmth and cause us to feel differently towards someone, even when the physical warmth is incidental and not salient for more than a minute.

IJzerman and Semin (2009) further developed these findings: using the same method to provide exposure to physical warmth as that employed by Williams and Bargh (2008), they then asked participants to rate their relationship with another person chosen from memory. Subjects in the warm-cup condition thought of more relationships with high social proximity than those in the cold-cup condition, again indicating that physical temperature has a strong relationship with interpersonal judgments. This research supports the idea that some aspects of cognitive processes are embodied (Mahon & Caramazza, 2008), meaning that physical bodily experiences affect our thoughts, judgments, and behaviors (Markman & Brendl, 2005).

This postulated relationship between cold and loneliness is bidirectional: not only does warmth prime one to think of more pro-social relationships, but social exclusion can cause one to feel physically cold and seek out physical warmth. Participants who have just recalled instances of social exclusion feel physically colder, as measured by their estimates of room temperature, than participants who have recalled experiences of social inclusion (Zhong & Leonardelli, 2008). The same results were found when participants were invited to take part in a virtual ball game but were then socially excluded from it.

When individuals experience a lack of interpersonal warmth, they may attempt to replace it with physical warmth: participants who scored high on the UCLA loneliness scale reported taking longer and warmer showers than those who scored low on the same test (Bargh & Shalev, 2012). Similarly, subjects who perceive themselves as being excluded by another participant rate warm foods as more desirable than cold food, as compared to inclusion or control conditions (Zhong & Leonardelli, 2008).

There is an intimate relationship between the physical and the mental, so that bodily experience influences our cognitive processes, as is discussed by Garbarini and Adenzato (2004). The reason for this association between warm and cold with interpersonal inclusion and exclusion, respectively, is thought to be due to early life experiences, where proximity to a caregiver provides warmth but distance results in coldness. This would suggest that the association is imprinted in us from an early age (Williams & Bargh, 2008). This relationship is sufficiently strong that physical warmth and coldness can induce feelings of inclusion and exclusion, since Bargh and Shalev (2012) found that participants who were asked to hold a cold

thermal pack rated themselves as being significantly more lonely on the UCLA Loneliness Scale than participants who held a warm cup, presumably because holding the cold pack caused the activation of social exclusion knowledge in the participants.

A probable reason that physical temperature activates social exclusion/inclusion knowledge is because the insular cortex is involved in the processing of both physical and psychological temperatures (Williams & Bargh, 2008), and has been shown to be active both when processing thermal perception and during judgments of trust (Kang et al., 2011). Kang et al. suggest that when we are primed with physical temperature metaphorical social knowledge is activated and influences social judgments and behavior.

It is argued that this association is built via cognitive scaffolding, meaning that from an early age pre-existing tactile information from the environment is used as the basis to help form conceptual knowledge (Ackerman, Nocera, & Bargh, 2010). As young children we easily learn the simple concept that warmth or closeness are good, and cold or distance are bad. Then, as we develop, the more abstract concepts encountered are harder to process (as in complex social relations) and thus are built upon the more concrete primary or foundational concept (Williams, Huang, & Bargh, 2009). This ontogenetic scaffolding can be intentional yet is largely automatic. The physical environment is a strong foundational concept from which we gain information about interpersonal relationships. Williams et al. (2009) propose that as we build on our knowledge of temperature to better understand social relations these cognitions become associated, so that we come to use warmth and cold as metaphors. When we have a good relationship with an individual, we describe them as 'warm' and the relationship as 'close', whereas a disliked individual is seen as 'cold'.

The social relations knowledge that is associated with temperature knowledge comes to be stored in the same area, the insular cortex, an area which is more active when dealing with social exclusion rather than inclusion (Eisenberger et al., 2003). It is also more active when processing cold than warm temperature (Ackerman et al., 2010). In support of this idea, Williams and Bargh (2008) showed that when given the option of a reward either for themselves or for a friend, subjects who were exposed to warm tactile stimuli chose the gift for a friend 54% of the time. Conversely, when exposed to cold tactile stimuli they chose a reward for themselves 75% of the time. This research, and the data of Eisenberger et al. (2003), suggest that there is a stronger relationship between physical and psychological cold than between physical and psychological warmth.

Turning to the modality that is employed for priming, meaningful visual stimuli in general clearly may affect motivation, as shown for example in the weapons effect that is seen in studies of aggression (Berkowitz & LePage, 1967). However, little research has been done on the priming effects of visual warmth and cold upon emotion. One study has found that visual cues suggestive of temperature facilitated the categorization of words related to that temperature, so that computer backgrounds of campfire pictures caused a shorter reaction time for identification of anger related words (annoyed, mad, bitter, etc...) than pictures of icicles, suggesting that visual stimuli apparently can activate metaphor-related knowledge of temperatures (Wilkowski et al., 2009; Study 1B). Similar priming effects were found when words were presented visually, adorned with drawings of flames or icicles (Study 1A).

The above research supports theories holding that mental cognitions are not processes of the mind alone but, rather, composite interactions between the mind, the body, and the environment (Wilson, 2002). All incoming information is processed either consciously or unconsciously, and these theories hold that the unconscious information is not simply set aside. Rather, the incoming information from our sensory modalities influences our cognitions, thus affecting our feelings and behavior.

The induction of emotion is not limited to tactile stimuli, such as a warm or cold cup. Previous research suggests that emotions and feelings can be elicited by watching television media (Gross & Levenson, 1995), and that negative emotions that cause distress are particularly easy to elicit. Coyne et al. (2011) found that television media depicting ostracism caused the viewer to experience lower feelings of belonging and more distress, with lowered self-esteem, which resemble the typical characteristics of feeling lonely (Russell et al., 1980; Russell, 1996).

Based on the findings of Bargh and Shalev (2012), the goal of this study was to determine the effects of warm versus cold stimuli (tactile or visual) on self-reported feelings of loneliness, following a video which depicts ostracism. It was hypothesized that subjects in the warm conditions (either visual or tactile) would feel less lonely after viewing a video clip about ostracism, due to the warm stimuli activating knowledge of social inclusion and thus producing a buffering effect on induced loneliness, than the subjects in the cold conditions.

It was also predicted that the effect of warmth in reducing loneliness would be greater in the tactile than the visual condition, since this resembles the physical warmth that is provided by a caretaker.

Lastly it was hypothesized, on the assumption of additive priming effects, that the subjects in the warm combined condition (who encountered both visual and tactile stimuli) would show less loneliness, as compared with those in the warm tactile condition.

Method

Participants

The subjects were 90 unpaid university students (47 females and 43 males) living in a campus residence. They were recruited via telephone and volunteered to participate. Their ages ranged from 17 to 25 years of age.

Materials

The UCLA Loneliness Scale, Version 3, was used, which has been found to exhibit satisfactory reliability and validity (Russell, 1996). This scale consists of twenty self-report questions (e.g., “how often do you feel alone?”), which are scored from 1 (*never*) to 4 (*always*). To disguise the true nature of the study, an additional twenty questions drawn from a health survey were adjusted to match the wording of the UCLA Loneliness Scale and mixed in randomly with its items.

The same metal thermos flask was used across all touch conditions. For cold conditions the thermos was left in a refrigerator until it was chilled. For warm conditions it contained boiling water that brought the outside to a warm temperature.

The warm visual condition used a photo of burning logs in a fireplace, shown on a laptop.¹ The cold visual condition used a photo of an iceberg in the ocean. A simple black and white photo of a tree trunk was used as a filler stimulus for subjects in the tactile condition, while for the visual condition the thermos was presented at room temperature.

The video of ostracism employed was a ten-minute clip taken from the 1996 movie “Harriet the Spy”, depicting a girl being excluded from her circle of childhood friends. Her friends, on discovering she has been writing mean things about them, pass notes about her, insult and ignore her, and form a club dedicated to excluding her. This clip has been reported to induce moderate feelings of ostracism (Coyne, Nelson, Robinson, & Gunderson, 2011).

Design

A 2×3 independent groups design was used, with the temperature of the priming stimulus (warm or cold) and the modality of its presentation (visual, tactile, or combined visual and tactile) as independent variables. The dependent variable was the subject’s score on the UCLA Loneliness Scale.

Procedure

Each participant was randomly assigned to one of six groups: cold or warm visual, cold or warm tactile, and cold or warm combined conditions ($n = 15$). A slight deception was required in order that the subjects would not discover the true nature of the study, so they were told that they would be participating in a study of “ratings of self compared to others.”

After each subject had agreed to participate the experimenter went to their room, where they signed consent forms. Participants were then walked from their rooms to the room used for testing. Depending on their condition, participants held a cold thermos flask (for cold tactile and cold combined conditions), a warm thermos (for warm tactile and warm combined conditions) or a thermos at room temperature (for warm visual and cold visual conditions). The experimenter would feign having his hands full and ask the subjects to hold the thermos for the duration of the walk, about three minutes. No participants declined to hold the thermos.

Once in the experimenter’s residence room, the thermos was taken and participants were asked to sit in front of a desktop computer, which showed a picture of a black and white tree (for cold tactile or warm tactile conditions), a picture of a burning fireplace (for warm visual or warm combined conditions), or a picture of an iceberg in the ocean (for cold visual or cold combined conditions). The image remained on screen until the experimenter opened a video file containing the loneliness-inducing video clip, which was played for subjects in all conditions. The visual images of warmth or cold were visible for about ten to twenty seconds.

After the ten-minute long video clip all participants filled out the UCLA Loneliness Scale (Russell, 1996), which was hidden amongst other survey questions as fillers. After completing the survey subjects were asked what they thought the study was about. None gave any indication that they perceived the true nature of the study. They were then debriefed in full.

Results

Figure 1 shows the subjects' mean loneliness scores for the six conditions (warm/cold visual, warm/cold tactile, and warm/cold combined). These data are summarized in Table 1.

Table 1: Mean UCLA Loneliness scores as a function of prime temperature (warm/cold) × modality of presentation (visual/tactile/combined visual and tactile)

Prime temperature	Modality	<i>M</i>	<i>SD</i>
Warm	Visual	40.73	7.27
	Tactile	37.73	11.32
	Combined	38.06	11.48
Cold	Visual	41.60	8.09
	Tactile	44.20	12.04
	Combined	44.33	10.94

Note: $n = 15$. Maximum possible loneliness = 80, minimum possible = 20.

A 2 × 3 between-subjects ANOVA conducted on the loneliness scores for the effects of temperature of the prime (warm or cold) and its modality (visual, tactile, or combined), indicated that the warm stimulus, as compared to the cold, reduced loneliness, $F(1, 84) = 4.31, p = 0.041, \eta^2 = .049$. There was no significant effect from modality overall, $F(2, 84) = .004, p = .97, \eta^2 = .00$, nor an interaction between temperature and modality, $F(2, 84) = .71, p = .50, \eta^2 = .017$.

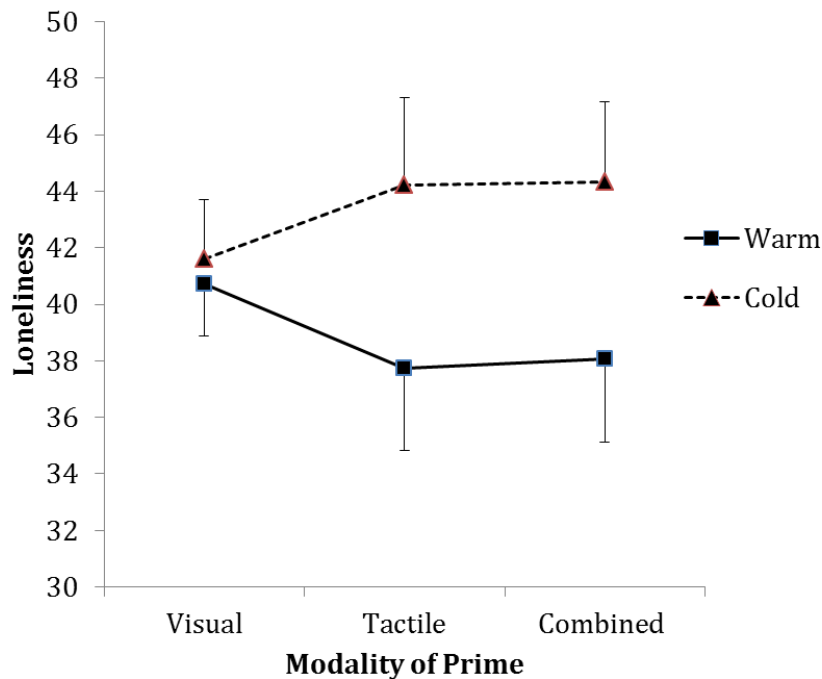
The combined tactile-visual conditions yielded scores almost identical to those for the corresponding tactile conditions. For the visual condition, the scores did not differ significantly between the warm ($M = 40.73, SD = 7.27$) and cold ($M = 41.60, SD = 8.09$) groups, $t(28) = 0.31, p = .76$. This difference represents a miniscule effect size, $d = 0.056$.

A one-way independent groups ANOVA was performed to compare loneliness scores as a function of warm versus cold temperature (with scores pooled over the three modality conditions), and yielded a slightly more significant effect of temperature, $F(1, 88) = 4.44, p = .038, \eta^2 = .048$. The difference between the warm and cold tactile conditions overall ($d = .55$), represents a medium effect size, according to the criteria of Cohen (1992)

Discussion

The tactile warmth condition was found to reduce the subjects' scores for loneliness, compared to the tactile cold condition. However, visual stimuli that depicted heat versus cold had no appreciable effect and left them at an intermediate level of loneliness. The results therefore support the experimental hypothesis that tactile warmth would reduce feelings of loneliness. This effect is likely due to the warm flask activating social warmth knowledge, causing subjects to feel more accepted, and the cold flask activating social exclusion knowledge, causing them to feel less accepted.

Figure 1: Mean UCLA Loneliness Scale scores of subjects who had experienced either a warm or a cold stimulus, presented via visual, tactile, or combined (visual plus tactile) modalities.



Note: Error bars represent SEMs.

Although some priming studies have proved difficult to repeat (Bartlett, 2013; Yong, 2012), this result provides a successful conceptual replication of the findings of Bargh and Shalev (2012), and also shows that exposure to the cold/warm conditions need not be made salient by directing the subjects' attention to the warm/cold stimuli that they hold. They also reinforce the conclusions of Williams and Bargh (2008), and of IJzerman and Semin (2009) that warm and cold stimuli can prime for feelings of inclusion or exclusion.

However, priming of loneliness via the visual modality was not found here. The warm visual and cold visual conditions did not differ significantly, nor did the combined groups (visual plus tactile stimuli) differ from the corresponding tactile groups. Therefore, visual stimuli did not measurably affect loneliness scores, nor produce the predicted additive effect when combined with the tactile stimuli. This conclusion is not definitive, since lengthening the exposure duration of the visual stimulus, for example, might increase its impact, but the observed visual-tactile difference is at least in line with the trend that may be predicted from the theory of the scaffolded mind (Williams et al., 2009), since caretakers provide tactile but not visual warmth to the infant. Another line of interpretation for the observed modality difference might be to note that tactile stimuli are warm or cold, whereas visual stimuli merely represent warmth or cold.

As visual warm or cold conditions apparently did not affect loneliness, these scores simply represent the baseline level following the video clip. Russell (1996) administered the UCLA

Loneliness Scale to 487 college students and found a mean score of 40.08 compared to the present study's warm visual (40.73) and cold visual (41.60) conditions, so the visual conditions here yielded similar scores to those obtained by Russell with subjects who had not been exposed to the ostracism video. Assuming external comparability, this suggests that the "Harriet" video did not have an appreciable effect on the loneliness levels of the subjects here, unlike the study of Coyne et al. (2011), possibly because nearly half their subjects were of British nationality and cultural differences could be involved.

Possible considerations for future research include ensuring that the base temperature of participants is equal across all conditions, which could be achieved by having participants sit in a waiting room that is controlled for temperature. Another modification would be to have more control conditions, so as to compare the loneliness scores of groups with and without exposure to the video clip.

Footnote: ¹ The warm, cold, and filler visual stimuli employed are available upon request to the second author.

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